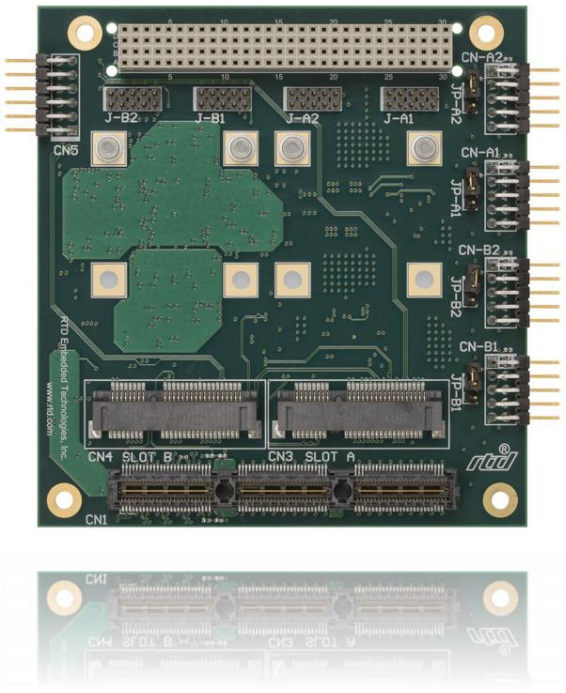
IM25410HR

IM35410HR

Mini PCI Express Carrier Module

User's Manual

BDM-610020120 Rev. C



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Rev B	1/23/2015	Correct part number in two diagrams from IM25100 to IM25410. Updated the table of figures to reflect the corrected part numbers. Remove blank space in the document bookmarks / navigation Improve wording in section 3.3 Correct labels of J-A1 and J-A2 on Figure 3
Rev C	2/16/2015	Add pinouts and dimensional drawing for IDAN

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1 Introduction

1.1 Product Overview

RTD's IM25410HR and IM35410HR modules offer dual Mini PCI Express sockets, designed to permit integration of third party Mini PCI Express modules into rugged PCIe/104 and PCI/104-Express systems and enclosures. Mini PCI Express (also referred to as PCI Express Mini Card, Mini PCIe, mPCIe, and PEM) is a form factor for devices which supports both PCI Express and USB 2.0 connectivity.

An onboard PCIe Gen 2 switch provides a x1 PCI Express connection to each of the dual sockets on the IM25410HR and IM35410HR, using only one upstream x1 PCI Express link from the bus. Similarly, an onboard USB 2.0 hub generates a USB 2.0 link for each of the dual sockets using only one USB 2.0 link from the bus. Additional links on the PCIe Gen2 switch and USB 2.0 hub are utilized to repopulate the x1 PCI Express link and USB link these devices use from the host, making these links available to the next x1 PCI Express or USB peripheral in the system.

For devices installed in the dual mini PCI Express sockets of the IM25410HR or IM35410HR-- referred to as Sockets A and B throughout this hardware manual (or designators CN3 and CN4, respectively) – a pair of 2mm 10-pin connectors is available per socket, permitting breakout of additional I/O on third party modules that do not use the socket interface (e.g. CAN bus). Such connections may be easily wired to these 2mm headers, and accessed by external devices via a corresponding set of 0.1" 10-pin I/O connectors on the board edge.

The dual sockets on the IM25410HR and IM35410HR permit mounting of full and half-length Mini PCI Express modules, allowing maximum flexibility with the specification.

NOTE: The IM25410HR is a PCI/104-Express module, and includes a pass-through PCI connector. The IM35410HR is PCIe/104, and does not include a pass-through PCI connector. Throughout the remainder of this manual, "IM25410HR" refers to both boards unless otherwise noted.

1.2 Board Features

- PCI Express Universal Connector
  - Permits compatibility with PCIe/104 Type 1 and Type 2 cpuModules
  - CPU_DIR pin permits stacking above or below the CPU
  - +5V-only operation
- Pass-through PCI Connector (IM25410HR only)
- Onboard PCIe Gen 2 Switch and USB 2.0 hub
  - Dual sockets require only one x1 PCI Express link and/or one USB 2.0 link for operation
  - Full x1 PCI Express link and USB 2.0 link repopulation
- Dual Mini PCI Express Card Sockets
  - Each socket supports three modes of operation
    - Single x1 PCIe link **and** single USB 2.0 link
    - Single x1 PCIe link
    - Single USB 2.0 link
  - Mounting holes permit installation of Full-Mini and Half-Mini sized Mini PCI Express modules
  - LED connector provide external access to the LED signals on both Mini PCI Express sockets

1.3 Ordering Information

The IM25410HR and IM35410HR are available with the following options:

Table 1: Ordering Options

Part Number	Description
IM25410HR	Dual Mini PCI Express sockets, PCI/104-Express
IM35410HR	Dual Mini PCI Express sockets, PCIe/104
IDAN-IM25410HR	Dual Mini PCI Express sockets, PCI/104-Express; in IDAN enclosure
IDAN-IM35410HR	Dual Mini PCI Express sockets, PCIe/104; in IDAN enclosure

The Intelligent Data Acquisition Node (IDAN™) building block can be used in just about any combination with other IDAN building blocks to create a simple but rugged 104™ stack. This module can also be incorporated in a custom-built RTD HiDAN™ or HiDANplus High Reliability Intelligent Data Acquisition Node. Contact RTD sales for more information on our high reliability systems.

For Mini PCI Express modules that require connectivity to small coaxial connectors (i.e. GPS, wireless LAN, Bluetooth, and other wireless communication protocols), RTD offers additional modules utilizing Mini PCI Express which allow breakout of small coaxial connectors to external MCX jacks. For more information on these products, contact RTD sales or refer to the RTD website.

1.4 Contact Information

1.4.1 Sales Support

For sales inquiries, you can contact RTD Embedded Technologies sales via the following methods:

Phone: 1-814-234-8087 Monday through Friday, 8:00am to 5:00pm (EST).
E-Mail: sales@rtd.com

1.4.2 Technical Support

If you are having problems with you system, please try the steps in the Troubleshooting section of this manual.

For help with this product, or any other product made by RTD, you can contact RTD Embedded Technologies technical support via the following methods:

Phone: 1-814-234-8087 Monday through Friday, 8:00am to 5:00pm (EST).
E-Mail: techsupport@rtd.com

2 Specifications

2.1 Board Operating Conditions

Table 2: Operating Environment and Storage Conditions

Symbol	Parameter	Test Condition	Min	Max	Unit
T_a	Operating Temperature		-40	+85	C
T_s	Storage Temperature		-55	+125	C
RH	Relative Humidity	Non-Condensing	0	90%	%

NOTE: The Operating Environment and Storage Conditions listed in Table 2 apply to the IM25410HR and IM35410HR board only. For recommended operating conditions of third party Mini PCI Express modules, refer to documentation from the manufacturer.

2.2 Board Electrical Characteristics

The bus connectors on the IM25410HR and IM35410HR offer several voltage inputs. Only +5V is required for operation, and is used to generate the voltage requirements for both Mini PCI Express sockets. All other bus connector supply voltages are pass-through and unused by the IM25410HR and IM35410HR.

Table 3: Supply Voltage Requirements

Symbol	Parameter	Note	Min	Max	Unit
V_{cc5}	5 V Supply Voltage		4.75	5.25	V
$V_{cc5\text{-}STBY}$	5 V Stand-by Supply Voltage		n/a	n/a	V
V_{cc3}	3.3 V Supply Voltage		n/a	n/a	V
V_{cc12}	12 V Supply Voltage		n/a	n/a	V
$V_{cc\text{-}12}$	-12 V Supply Voltage	IM25410HR only	n/a	n/a	V

Supply current and power consumption for the IM25410HR and IM35410HR are listed in the table below.

Table 4: Power Ratings

Symbol	Parameter	Test Condition	Min	Max	Unit
P	Power Consumption	V_{cc5} = 5.0 V, Typical		2.45	W
I_{cc5}	5 V Input Supply Current	Active		490	mA
Mini PCI Express – Peak Current per Socket					
$I_{cc3.3\text{-}AB\text{-}PK}$	3.3 V Input Supply Current	Peak current; Socket A or B		2.750	A
$I_{cc1.5\text{-}AB\text{-}PK}$	1.5 V Input Supply Current	Peak current; Socket A or B		0.500	A
Mini PCI Express – Combined Current (Sockets A and B)					
$I_{cc3.3}$	3.3 V Input Supply Current	Combined current; Socket A + B		4.000	A
$I_{cc1.5}$	1.5 V Input Supply Current	Combined current; Socket A + B		1.000	A

NOTE: Power measurements were recorded with no devices installed in the Mini PCI Express sockets.

2.3 Mini PCI Express Operating Conditions

Each Mini PCI Express module has its own individual operating conditions which will vary from one manufacturer's device to another. Installing third party Mini PCI Express modules on the IM25410HR can affect the overall operating temperature of the system. Make sure to verify the operating conditions of third party Mini PCI Express modules before using the IM25410HR in extreme conditions.

2.4 Physical Characteristics

- Weight: Approximately 55 g (0.12 lbs.)
- Dimensions: 90.17 mm L x 95.89 mm W (3.550 in L x 3.775 in W)

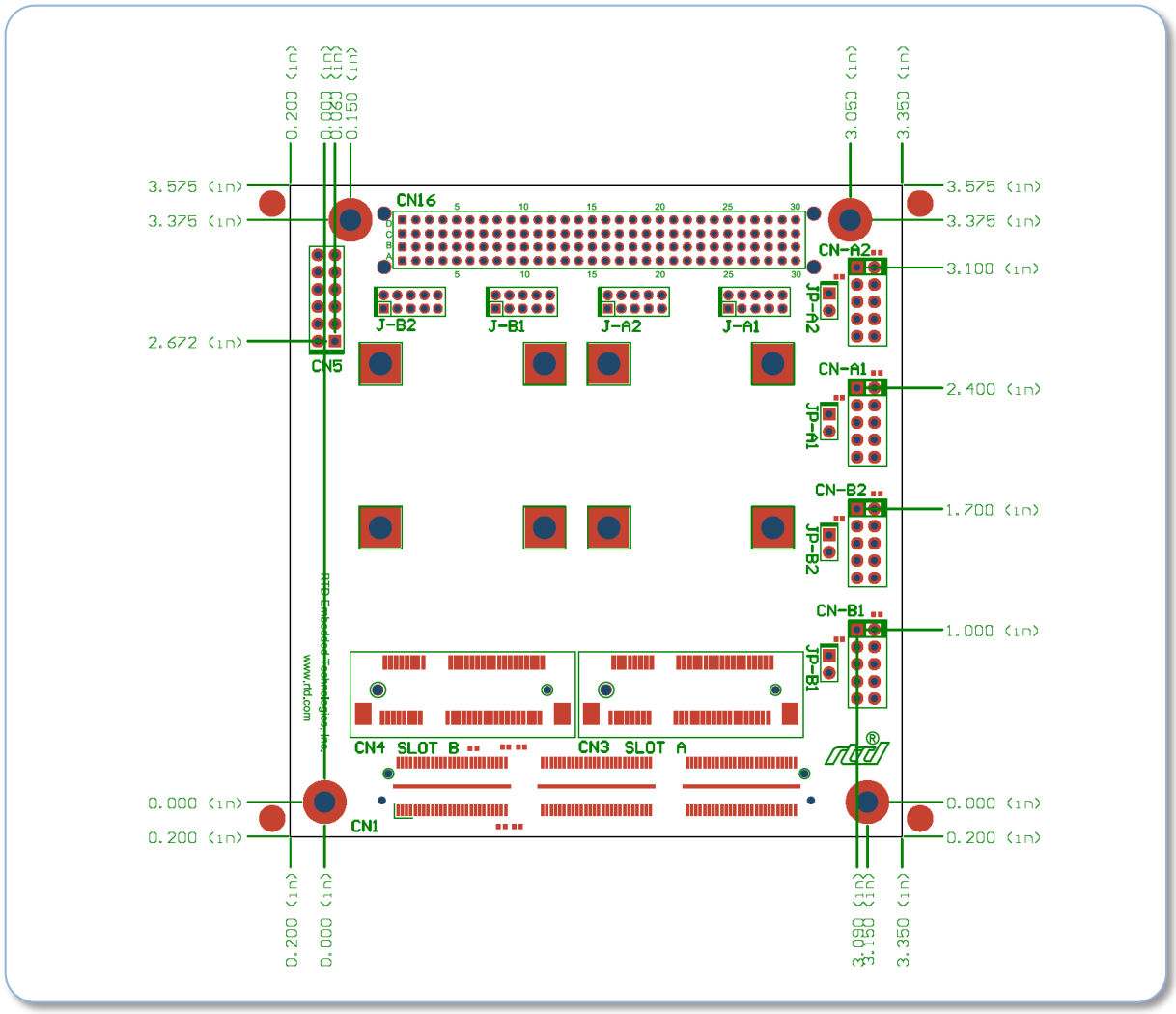

Figure 1: IM25410HR Board Dimensions

3 Board Connections and Functionality

3.1 Board Handling Precautions

To prevent damage due to Electrostatic Discharge (ESD), keep your board in its antistatic bag until you are ready to install it into your system. When removing it from the bag, hold the board at the edges, and do not touch the components or connectors. Handle the board in an antistatic environment, and use a grounded workbench for testing and handling of your hardware.

3.2 Steps for Installing

1. Always work at an ESD protected workstation, and wear a grounded wrist-strap.
2. Turn off power to the PC/104 system or stack.
3. Select and install stand-offs to properly position the module on the stack.
4. Remove the module from its anti-static bag.
5. Check that pins of the bus connector are properly positioned.
6. Check the stacking order; make sure all of the busses used by the peripheral cards are connected to the cpuModule.
7. Hold the module by its edges and orient it so the bus connector pins line up with the matching connector on the stack.
8. Gently and evenly press the module onto the PC/104 stack.
9. If any boards are to be stacked above this module, install them.
10. Attach any necessary cables to the PC/104 stack.
11. Re-connect the power cord and apply power to the stack.
12. Boot the system and verify that all of the hardware is working properly.

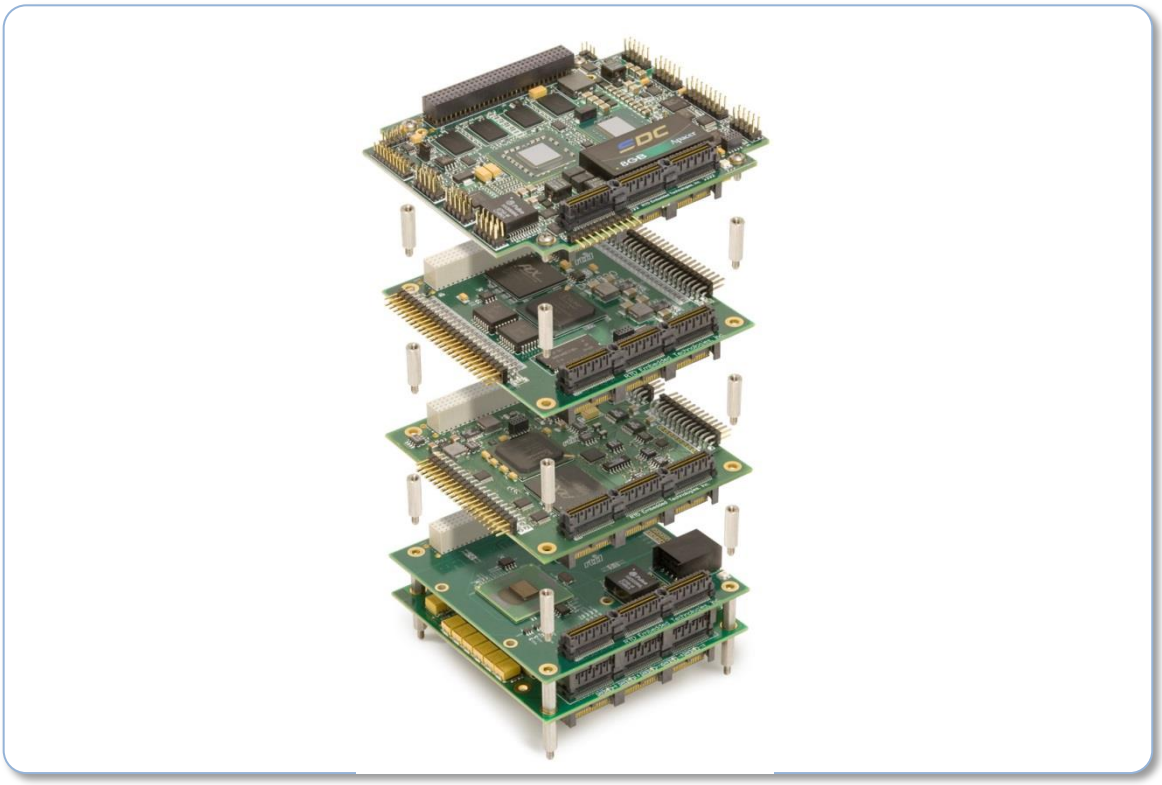

Figure 2: Example 104™ Stack

3.3 Connector and Jumper Locations

The following top-side photo of the IM25410HR provides a reference for designators of the bus connectors, I/O connectors, and jumpers as well as their locations.

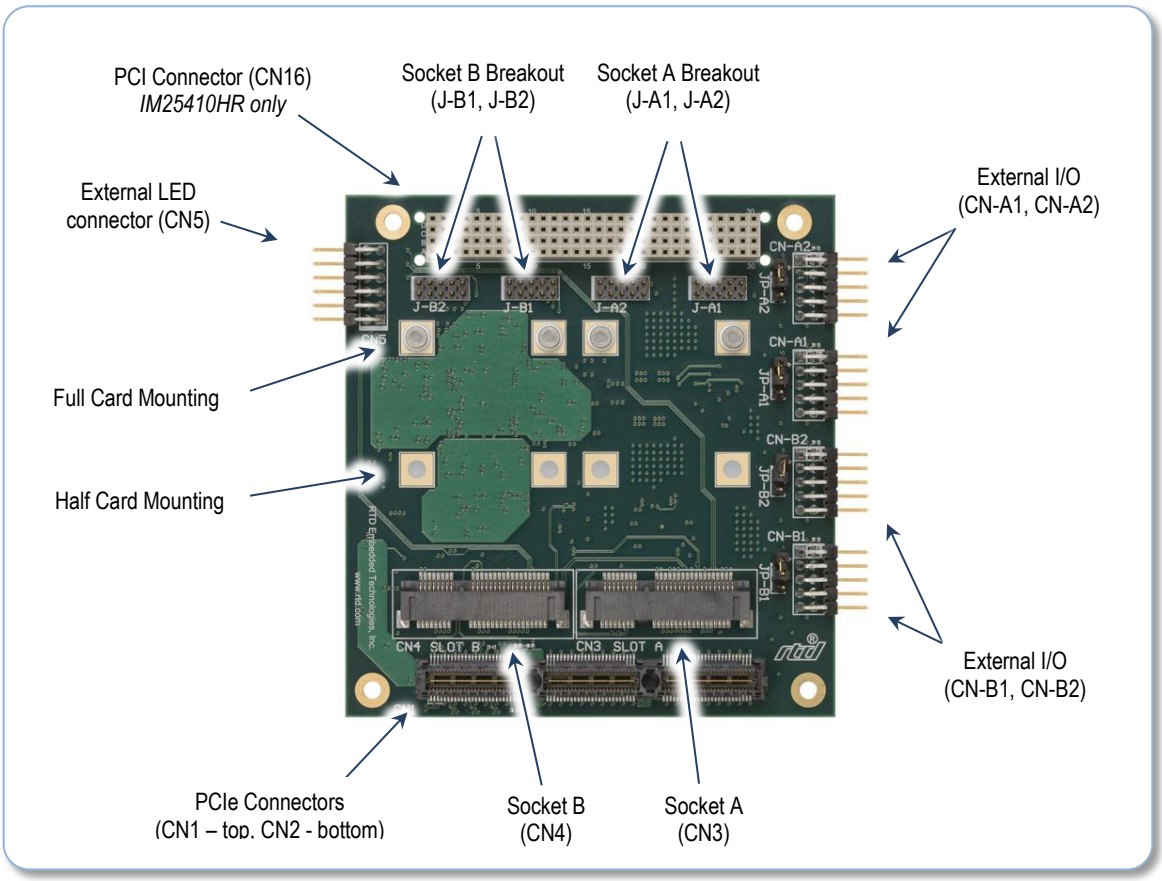

Figure 3: IM25410HR (Top View)

3.4 Functional Diagram

The Figure below shows the functional block diagram of the IM25410HR's dual Mini PCI Express sockets and their respective breakout and I/O connectors. The various parts of the block diagram are discussed in the following sections.

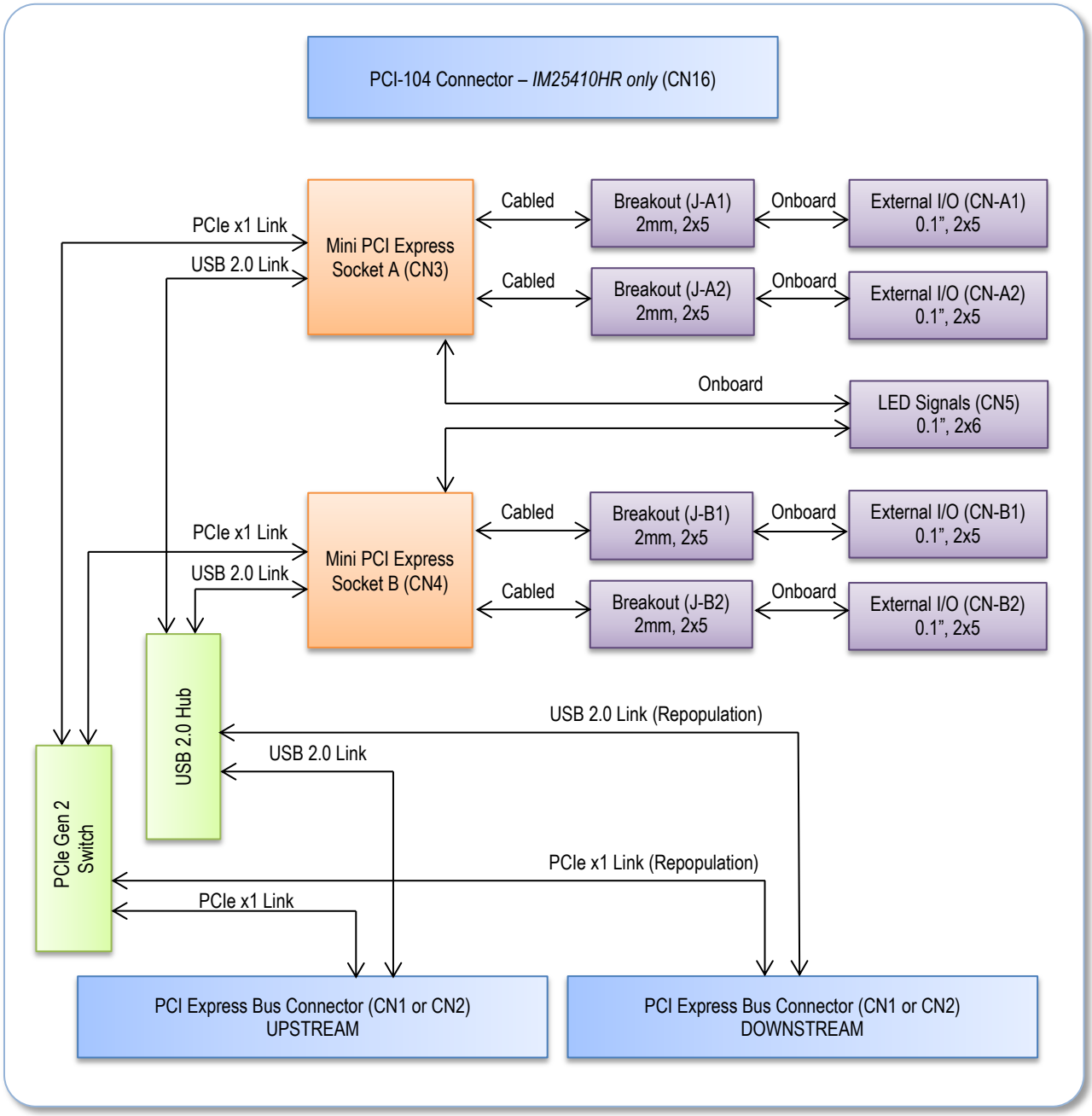

Figure 4: IM25410HR Block Diagram

3.5 Connector and Jumper Functionality

3.5.1 Bus Connectors

Table 5: IM25410HR Bus Connectors

Connector	Function	Size and Pitch	Mating Connector
CN1	PCIe/104 Universal Bus (Top)	156-pin, 0.635mm	Samtec ASP-129646-03
CN2	PCIe/104 Universal Bus (Bottom)	156-pin, 0.635mm	Samtec ASP-129637-03
CN16	PCI-104 (PCI) Bus *(IM25410HR only)*	120-pin, 2mm	Samtec ESQT-130-02-G-Q-368

PCIe Connectors (CN1 – Top, CN2 – Bottom)

The IM25410HR is a "Universal" board, and can connect to either a Type 1 or Type 2 connector of a PCIe/104 or PCI-104 Express system. The position and pin assignments are compliant with the *PCI/104-Express Specification*. (See PC/104 Specifications on page 22)

PCI Connector – *IM25410HR only* (CN16)

The PCI connector is the connection to PCI peripheral modules. This connector is used on this board as a pass-through connector only.

3.5.2 Internal and External I/O Connectors

The IM25410HR offers two sockets for installing a third party mini PCI Express module, Socket A (CN3) and Socket B (CN4). For each module, an onboard 10-pin 2mm header is offered to easily bring any connections from the module to the IM25410HR, allowing the user to easily interface to these connections using a rugged 10-pin 0.1" header.

Table 6: IM25410HR I/O Connectors

Socket A	Function	Size and Pitch	Mating Connector
CN3	Mini PCI Express, Socket A	*(Refer to PCI Express Mini Card Electromechanical Specification)*	
J-A1	Socket A: channel 1 of 2 breakout	2x5, 2mm, vertical	FCI 89947-710LF
J-A2	Socket A: channel 2 of 2 breakout	2x5, 2mm, vertical	FCI 89947-710LF
CN-A1	Socket A: channel 1 of 2 interface	2x5, 0.1", right angle	3M 89110-0001
CN-A2	Socket A: channel 2 of 2 interface	2x5, 0.1", right angle	3M 89110-0001
Socket B	**Function**	**Size and Pitch**	**Mating Connector**
CN4	Mini PCI Express, Socket B	*(Refer to PCI Express Mini Card Electromechanical Specification)*	
J-B1	Socket B: channel 1 of 2 breakout	2x5, 2mm, vertical	FCI 89947-710LF
J-B2	Socket B: channel 2 of 2 breakout	2x5, 2mm, vertical	FCI 89947-710LF
CN-B1	Socket B: channel 1 of 2 interface	2x5, 0.1", right angle	3M 89110-0001
CN-B2	Socket B: channel 2 of 2 interface	2x5, 0.1", right angle	3M 89110-0001
Socket A / B	**Function**	**Size and Pitch**	**Mating Connector**
CN5	Socket A & Socket B LED signals	2x6, 0.1", right angle	AMP 87456-8

NOTE: Communication busses on some Mini PCI Express modules may have bit rate requirements that are dependent on the bus length. When considering bus length, there are up to 5" of trace on the IM25410HR between the 2mm breakout connectors and 0.1" eternal I/O connectors.

Mini PCI Express Sockets A and B (CN3, CN4)

The IM25410HR offers two soldered-down connectors that support third party Mini PCI Express modules.

Sockets A and B on the IM25410HR (or designators CN3 and CN4) each offer one downstream x1 PCI Express Gen 2 link and one downstream USB 2.0 link from the host cpuModule to the Mini PCI Express device installed in the socket. For maximum flexibility, the IM25410HR provides mounting holes for cards designed to both the Full-Mini and Half-Mini card Mini PCI Express form factors.

The pinout for each Mini PCIe Express connector is shown below.

Table 7: CN3 and CN4 Pin Assignments

Pin Name	#	#	Pin Name
(Reserved)	51	52	3.3 V
(Reserved)	49	50	GND
(Reserved)	47	48	1.5 V
(Reserved)	45	46	LED_WPAN#
GND	43	44	LED_WLAN#
3.3 V	41	42	LED_WWAN#
3.3 V	39	40	GND
GND	37	38	USB_D_P
GND	35	36	USB_D_N
PET0_P	33	34	GND
PET0_N	31	32	SMB_DATA
GND	29	30	SMB_CLK
GND	27	28	1.5 V
PER0_P	25	26	GND
PER0_N	23	24	3.3 V
GND	21	22	PERST#
(Reserved)	19	20	*(Reserved)*
(Reserved)	17	18	GND
Pin Name	**#**	**#**	**Pin Name**
GND	15	16	*(Not Connected)*
REFCLK_P	13	14	*(Not Connected)*
REFCLK_N	11	12	*(Not Connected)*
GND	9	10	*(Not Connected)*
CLKREQ#	7	8	*(Not Connected)*
(Not Connected)	5	6	1.5 V
(Not Connected)	3	4	GND
(Reserved)	1	2	3.3 V

LED Connector for Sockets A and B (CN5)

The LED connector provides external access to the LED_WPAN#, LED_WLAN#, and LED_WWAN# signals on the Mini PCI Express sockets.

Each LED signal on the Mini PCI Express sockets CN3 and CN4 is current limited with a 110 ohm (1%) resistor. Connect the LED cathode to the odd pins, and the LED anode to the signal's corresponding even pin.

Table 8: CN5 Pin Assignments

Socket - Pin Number - Name	#	#	Pin Name
CN3 - pin 42 - LED_WWAN#	1	2	3.3 V
CN3 - pin 44 - LED_WLAN#	3	4	3.3 V
CN3 - pin 46 - LED_WPAN#	5	6	3.3 V
CN4 - pin 42 - LED_WWAN#	7	8	3.3 V
CN4 - pin 44 - LED_WLAN#	9	10	3.3 V
CN4 - pin 46-- LED_WPAN#	11	12	3.3 V

Breakout and I/O Connectors for Sockets A and B

Sockets A and B on the IM25410HR (CN3 and CN4, respectively) offer dual 2mm breakout connectors (J-A1, J-A2, J-B1, J-B2) for signals on Mini PCI Express modules that are made available on the module but are not accessible as signals on the Mini PCI Express connectors (e.g. CAN bus). Such connections may easily be wired to these 2mm breakout headers and accessed via corresponding sets of 0.1" 10-pin I/O connectors on the board edge. Each 2mm breakout connector is wired directly to its corresponding 0.1" I/O connector using a 1-to-1 pin assignment, which provides convenient accessibility to the outside world.

The following table shows the pin mapping for each of the four 2mm / 0.1" connector pairs on the IM25410HR.

Table 9: Breakout and I/O Connector Pin Assignments

Pin Name	#	#	Pin Name
Signal 1	1	2	Signal 2
Signal 3	3	4	Signal 4
Signal 5	5	6	Signal 6
Signal 7	7	8	Signal 8
Signal 9	9	10	Signal 10

A 9-pin DSUB connector provides a convenient way to breakout the on board 0.1" I/O connectors. The following table shows the pin mapping from an onboard I/O connector to a 9-pin DSUB connector, and holds true for each of the four 0.1" I/O connectors on the IM25410HR.

Table 10: Common DSUB Connector Mapping

Pin Name	0.1" I/O Connector Pin Number	9-Pin DSUB Connector Pin Number	Example RS-232	Example CAN-Bus
Signal 1	1	1	Data Carrier Detect, DCD	*(Not Connected)*
Signal 2	2	6	Data Set Ready, DSR	GND
Signal 3	3	2	Receive Data, RXD	CAN_L
Signal 4	4	7	Request To Send, RTS	CAN_H
Signal 5	5	3	Transmit Data, TXD	GND
Signal 6	6	8	Clear To Send, CTS	*(Not Connected)*
Signal 7	7	4	Data Terminal Ready, DTR	*(Not Connected)*
Signal 8	8	9	Ring Indicate, RI	*(Not Connected)*
Signal 9	9	5	Signal Ground, GND	*(Not Connected)*
Signal 10	10	Not Connected	*(Not Connected)*	*(Not Connected)*

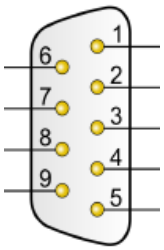

Figure 5: 9-pin DSUB Connector Pinout

For each channel's connectors, signals 3 and 4 offer a corresponding jumper which may be populated to connect the signals with a 120 ohm resistor. This is especially useful for some third party CAN bus Mini PCI Express modules, which may require 120 ohm termination at the transmitter and/or receiver, but do not include termination on the module. For more information, refer to section 3.5.3.

Signals 2 and 5 offer a resistor which may be populated to short the signals together. This is especially useful for some third party CAN bus Mini PCI Express modules, where shorting of these signals is required for operation. If your IM25410HR was shipped with a third party CAN bus module installed, these resistors may have been populated by the factory prior to shipment, resulting in these signals being shorted.

Each signal offers a resistor option which may be populated to pull the pin's signal down to digital ground.

(For more information on these resistor options, contact RTD Technical Support.)

3.5.3 JUMPERS

For Mini PCI Express cards that require 120-ohm termination (some Mini PCI Express CAN bus modules), both channels on each socket offer a jumper which may be installed to enable 120-ohm termination across signals 3 and 4 of the jumper's corresponding I/O connectors.

To enable the termination, install the jumper. *(As a rugged alternative to the jumper-enabled termination, a resistor option may be configured to permanently enable the termination. Contact RTD for more information.)*

Table 11: IM25410HR Termination-Enable Jumpers

Socket A Jumpers	Function	Size and Pitch
JP-A1	Close to enable 120-ohm termination on Socket A, channel 1	1x2, 0.1", vertical
JP-A2	Close to enable 120-ohm termination on Socket A, channel 2	1x2, 0.1", vertical
Socket B Jumpers	**Function**	**Size and Pitch**
JP-B1	Close to enable 120-ohm termination on Socket B, channel 1	1x2, 0.1", vertical
JP-B2	Close to enable 120-ohm termination on Socket B, channel 2	1x2, 0.1", vertical

3.6 Repopulation of PCI Express and USB Links

The Mini PCI Express sockets on the IM25410HR each operate using a x1 PCI Express link and/or USB 2.0 link. To relieve some of the stress on the system, the IM25410HR has an onboard PCI-Express Gen 2 switch and a USB 2.0 hub to generate these links, reducing the number of resources needed from the host cpuModule for the IM25410HR to operate.

These components are also used to generate one PCI Express Gen 2 link and one USB 2.0 link on the "downstream" side of the IM25410HR, repopulating the used links making them available for other peripherals up or down the stack. This allows each Mini PCI Express socket on IM25410HR to operate without consuming any PCI Express link or USB link on the bus.

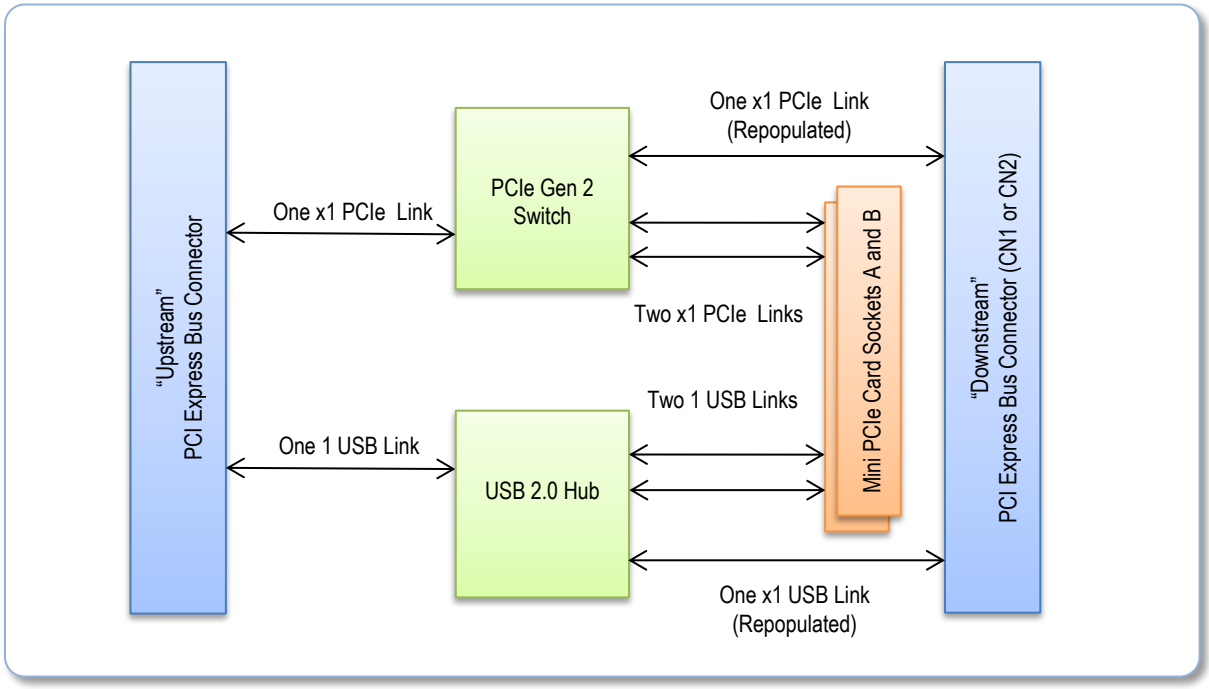

Figure 6: IM25410HR Link Repopulation Diagram (I/O Connectors Not Shown)

4 IDAN Connections

4.1 Module Handling Precautions

To prevent damage due to Electrostatic Discharge (ESD), keep your module in its antistatic bag until you are ready to install it into your system. When removing it from the bag, hold the module by the aluminum enclosure, and do not touch the components or connectors. Handle the module in an antistatic environment, and use a grounded workbench for testing and handling of your hardware.

4.2 Physical Characteristics

- Weight: Approximately 0.21 Kg (0.46 lbs.)
- Dimensions: 151.972 mm L x 129.978 mm W x 16.993 mm H (5.983 in L x 5.117 in W x 0.669 in H)

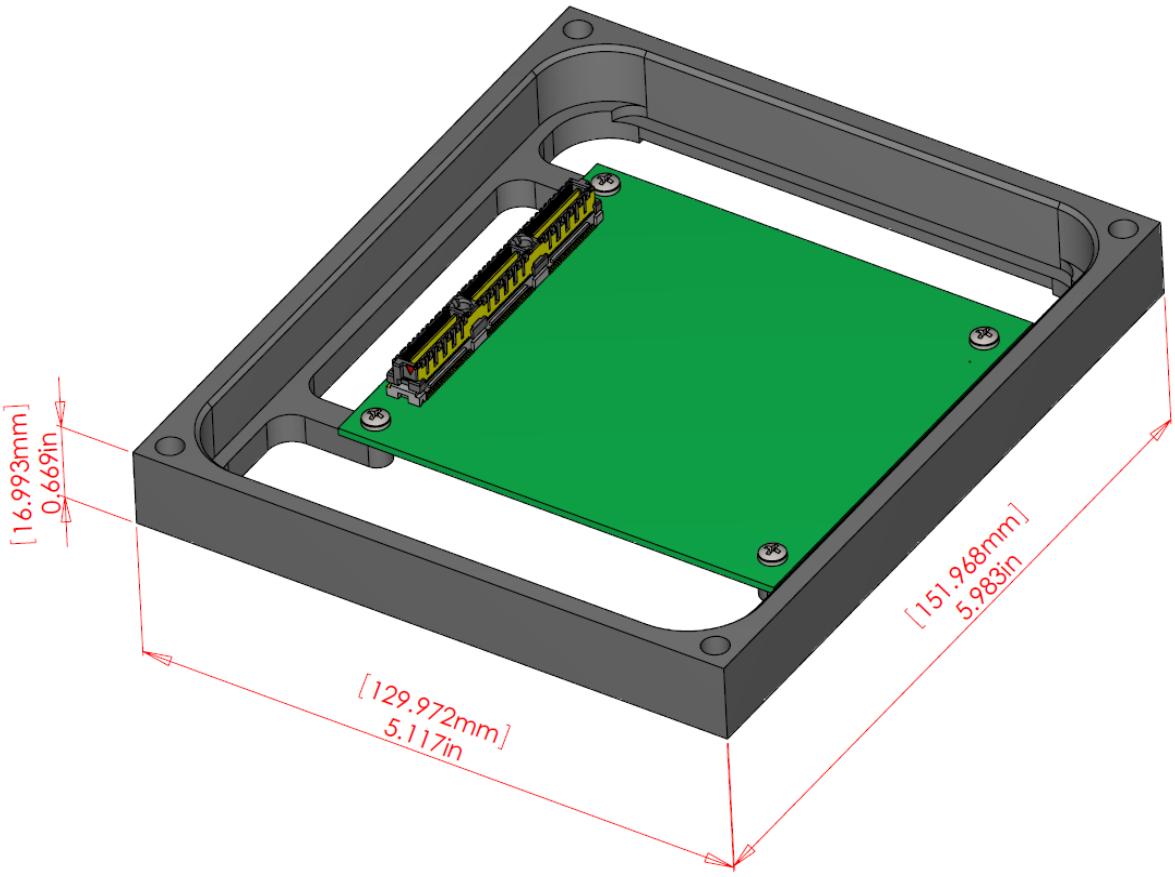

Figure 7: IDAN Dimensions – L x W x H

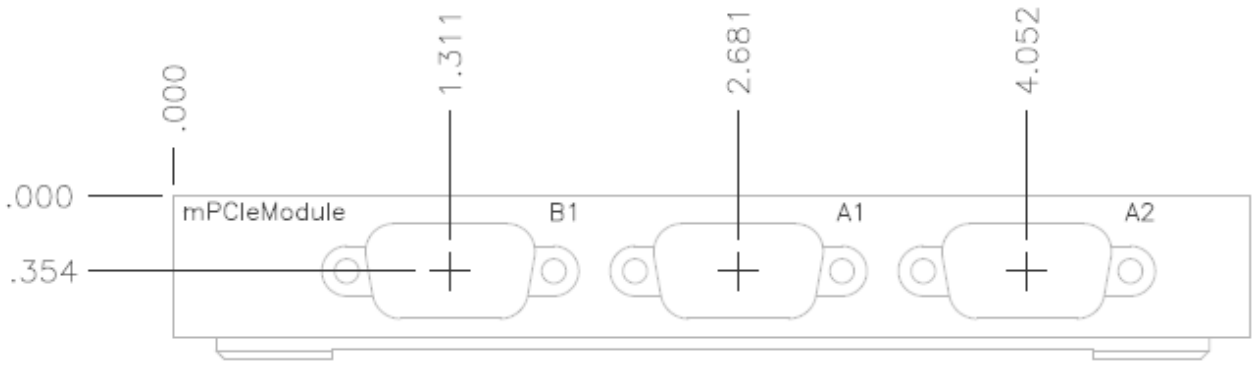

Figure 8: IDAN Front Panel Drawing

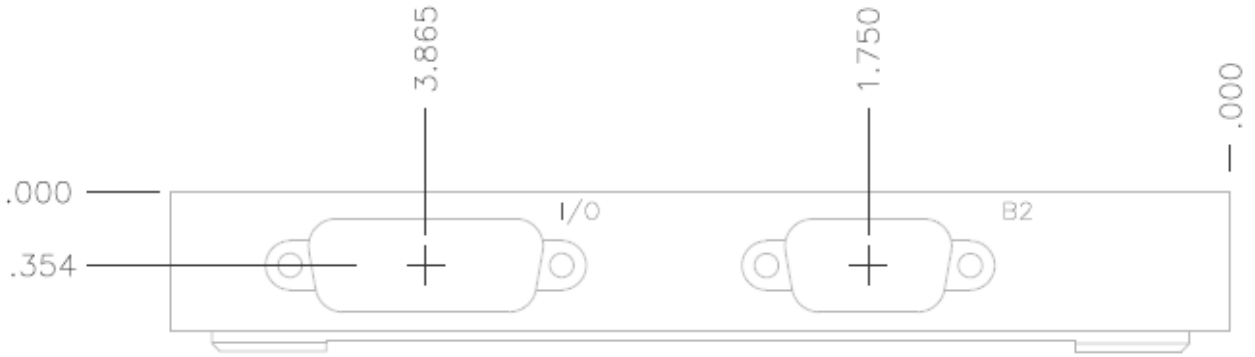

Figure 9: IDAN Back Panel Drawing

4.3 External I/O Connectors

This section describes the pinout for each connector on the IDAN-IM25410HR, and shows how the IDAN connector pins correspond to the pins of each I/O header on the IM25410HR.

The following table lists all connectors on the IDAN-IM25410HR frame as well as their mating connectors.

Table 12: IDAN Connectors and Mating Connectors

IDAN Designator	IDAN Connector Type	Function	Module Part Number	Mating Part Number
A1	9 pin “D”, male	I/O breakout	Adam Tech, DE09PD	Adam Tech, DE09SD
A2	9 pin “D”, male	I/O breakout	Adam Tech, DE09PD	Adam Tech, DE09SD
B1	9 pin “D”, male	I/O breakout	Adam Tech, DE09PD	Adam Tech, DE09SD
B2	9 pin “D”, male	I/O breakout	Adam Tech, DE09PD	Adam Tech, DE09SD
I/O	15 pin “D”, female	LED Status	AMP, 747052-3	AMP, 747043-3

4.3.1.1 I/O CONNECTORS FOR SOCKETS A AND B (A1, A2, B1, B2)

Four 9-pin male DSUB connectors on the IDAN frame connect directly to the 0.1" onboard I/O connectors (CN-A1, CN-A2, CN-B1, CN-B2). The pin mapping of each 9-pin DSUB connector to the corresponding 0.1" I/O connector is shown in the following table:

Table 13: IDAN Pinout: 9-pin Male DSUB Connectors (A1, A2, B1, B2)

9-pin male DSUB Connector Pin Number	0.1" I/O Connector Pin Number	Pin Name	Example RS-232	Example CAN-Bus
1	1	Signal 1	Data Carrier Detect, DCD	*(Not Connected)*
2	3	Signal 3	Receive Data, RXD	CAN_L
3	5	Signal 5	Transmit Data, TXD	GND
4	7	Signal 7	Data Terminal Ready, DTR	*(Not Connected)*
5	9	Signal 9	Signal Ground, GND	*(Not Connected)*
6	2	Signal 2	Data Set Ready, DSR	GND
7	4	Signal 4	Request To Send, RTS	CAN_H
8	6	Signal 6	Clear To Send, CTS	*(Not Connected)*
9	8	Signal 8	Ring Indicate, RI	*(Not Connected)*
Not Connected	10	Signal 10	*(Not Connected)*	*(Not Connected)*

For a detailed explanation of the onboard I/O signals, refer to section 3.5.2.

4.3.1.2 LED STATUS INDICATORS (I/O)

A 15-pin female DSUB connector labeled "I/O" allows access to LED status indicators on the Mini PCI Express cards installed on the IM25410HR. For more information on the LED status indicators, see section 3.5.2.

The pin mapping of the 15-pin DSUB connector to connector CN5 on the IM25410HR is shown in the following table:

Table 14: IDAN Pinout: LED Status Connector (I/O)

15-pin female DSUB Pin Number	CN5 Pin Number	Function
1	*(Not Connected)*	*(Reserved)*
2	*(Not Connected)*	*(Reserved)*
3	1	Slot B LED_WWAN#
4	3	Slot B LED_WLAN#
5	5	Slot B LED_WPAN#
6	7	Slot A LED_WWAN#
7	9	Slot A LED_WLAN#
8	11	Slot A LED_WPAN#
9	*(Not Connected)*	*(Reserved)*
10	*(Not Connected)*	*(Reserved)*
11	2	+3.3V
12	4	+3.3V
13	6	+3.3V
14	8	+3.3V
15	10	+3.3V
--	12	+3.3V

The LED signals are directly connected to the Mini PCI Express slots. The behavior of these signals will depend on the card installed. For more information, refer to the PCI Express Mini Card Electromechanical specification.

4.4 Steps for Installing

1. Always work at an ESD protected workstation, and wear a grounded wrist-strap.
2. Turn off power to the IDAN system.
3. Remove the module from its anti-static bag.
4. Check that pins of the bus connector are properly positioned.
5. Check the stacking order; make sure all of the busses used by the peripheral cards are connected to the cpuModule.
6. Hold the module by its edges and orient it so the bus connector pins line up with the matching connector on the stack.
7. Gently and evenly press the module onto the IDAN system.
8. If any boards are to be stacked above this module, install them.
9. Finish assembling the IDAN stack by installing screws of an appropriate length.
10. Attach any necessary cables to the IDAN system.
11. Re-connect the power cord and apply power to the stack.
12. Boot the system and verify that all of the hardware is working properly.

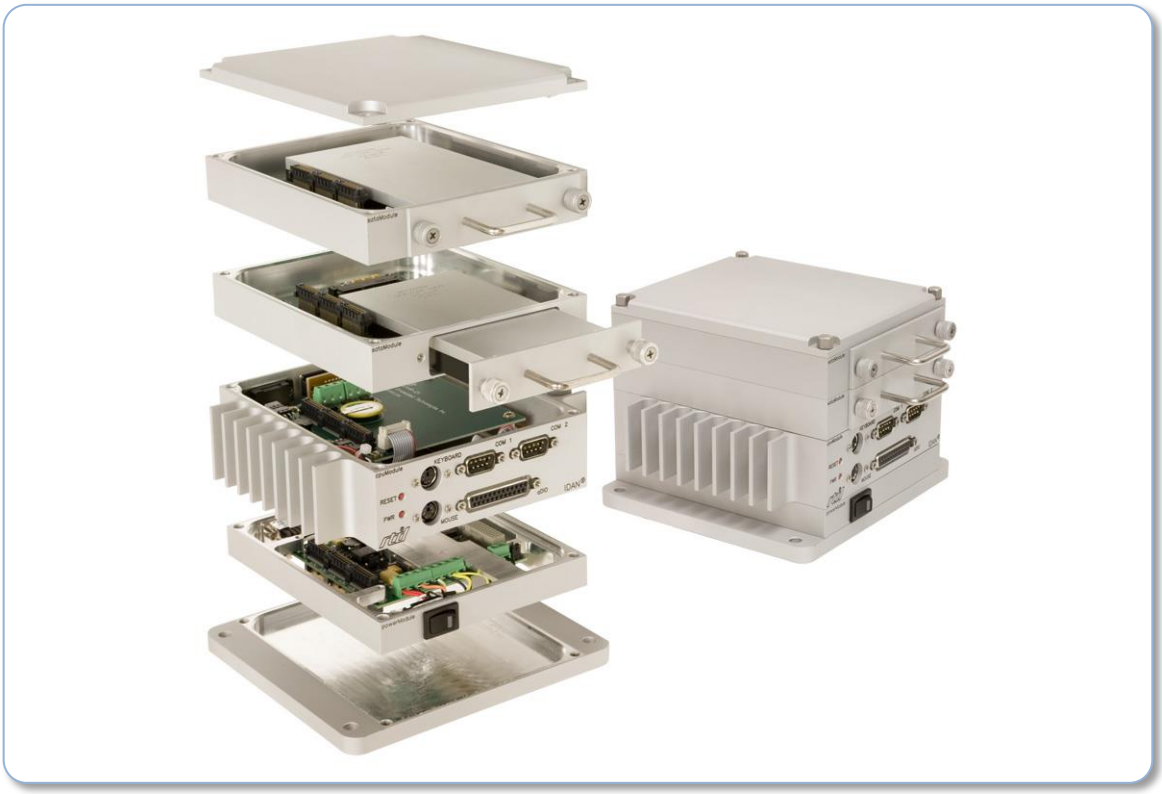

Figure 10: Example IDAN System

5 Troubleshooting

If you are having problems with your system, please try the following initial steps:

- **Simplify the System** – Remove modules one at a time from your system to see if there is a specific module that is causing a problem. Perform you troubleshooting with the least number of modules in the system possible.

- **Swap Components** – Try replacing parts in the system one at a time with similar parts to determine if a part is faulty or if a type of part is configured incorrectly.

If problems persist, or you have questions about configuring this product, contact RTD Embedded Technologies via the following methods:

Phone: +1-814-234-8087
E-Mail: techsupport@rtd.com

Be sure to check the RTD web site (http://www.rtd.com) frequently for product updates, including newer versions of the board manual and application software.

6 Additional Information

6.1 PC/104 Specifications

A copy of the latest PC/104 specifications can be found on the webpage for the PC/104 Embedded Consortium:

www.pc104.org

6.2 PCI and PCI Express Specification

A copy of the latest PCI and PCI Express specifications can be found on the webpage for the PCI Special Interest Group:

www.pcisig.com

6.3 PCI Express Mini Card Electromechanical Specification

A copy of the latest PCI Express Mini Card Electromechanical Specification can also be found on the webpage for the PCI Special Interest Group:

www.pcisig.com

7 Limited Warranty

RTD Embedded Technologies, Inc. warrants the hardware and software products it manufactures and produces to be free from defects in materials and workmanship for one year following the date of shipment from RTD Embedded Technologies, Inc. This warranty is limited to the original purchaser of product and is not transferable.

During the one year warranty period, RTD Embedded Technologies will repair or replace, at its option, any defective products or parts at no additional charge, provided that the product is returned, shipping prepaid, to RTD Embedded Technologies. All replaced parts and products become the property of RTD Embedded Technologies. Before returning any product for repair, customers are required to contact the factory for a Return Material Authorization (RMA) number.

This limited warranty does not extend to any products which have been damaged as a result of accident, misuse, abuse (such as: use of incorrect input voltages, improper or insufficient ventilation, failure to follow the operating instructions that are provided by RTD Embedded Technologies, “acts of God” or other contingencies beyond the control of RTD Embedded Technologies), or as a result of service or modification by anyone other than RTD Embedded Technologies. Except as expressly set forth above, no other warranties are expressed or implied, including, but not limited to, any implied warranties of merchantability and fitness for a particular purpose, and RTD Embedded Technologies expressly disclaims all warranties not stated herein. All implied warranties, including implied warranties for merchantability and fitness for a particular purpose, are limited to the duration of this warranty. In the event the product is not free from defects as warranted above, the purchaser's sole remedy shall be repair or replacement as provided above. Under no circumstances will RTD Embedded Technologies be liable to the purchaser or any user for any damages, including any incidental or consequential damages, expenses, lost profits, lost savings, or other damages arising out of the use or inability to use the product.

Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, and some states do not allow limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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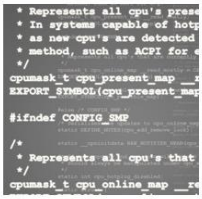

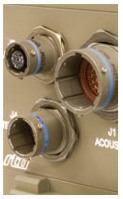
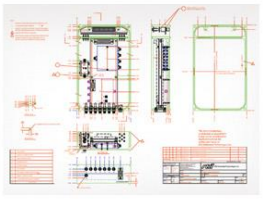

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